

## REMARKS

The Office Action mailed 17 December 2008, has been received and its contents carefully noted. The pending claims, claims 1-12, were rejected. Reconsideration in view of the following is respectfully requested.

### Rejection under 35 U.S.C. 103(a)

The Examiner rejected claims 1-12 under 35 U.S.C. 103(a) as being unpatentable over EP 0718024 (EP '024) in view of EP 0294588 (EP '588). Specifically, the Examiner deemed that it would have been obvious to pelletize the zeolite to provide an adsorption bed having a low pressure drop due to open spaces that exist between zeolite pellets, and to use a low inert binder content in order to maximize the amount of absorbent available for air treatment. The Examiner noted that he did not give any consideration to the arguments regarding the European Opposition because the decision was in French.

Applicants respectfully submit that EP '024 and EP '588, alone or in combination, do not teach or suggest the claimed invention which is supported by the decision to deny the opposition in the corresponding EP patent, EP Patent No. 1 062 022 (EP Appl. No. 99 939170.9). The English translation of the decision of the Board of Appeal No. T 1362/04 (Decision) is submitted herewith. As provided in the Decision, the the Opposition Division of the European Patent Office (EPO) analyzed the disclosure of EP '024 and EP '588 and deemed that the claimed invention is novel and unobvious (i.e. satisfies the inventive step requirement). Therefore, the EPO dismissed the opposition and upheld the validity of the corresponding EP patent.

In particular, the EPO addressed the inventive step at point 2, pages 7-12, of the Decision. According to the EPO, EP '024, i.e. document (1) “discloses the two essential characteristics of the subject-matter of Claim 1 [of the present invention], namely the degree of exchange with sodium of greater than or equal to 98% and the content of binder of less than 20%”. See paragraph V on page 3. Therefore, “the technical problem to be solved [according to the present invention] consisted in improving the process of the document (1) in order to be able to more efficiently separate the CO<sub>2</sub> from a stream of air”.

In point 2.2, the EPO further states that “the technical problem to be solved consists in

improving the effectiveness for the decarbonation under low CO<sub>2</sub> pressures, that is to say pressures of the order of 2 mbar (page 2, line 56, to page 3, line 1)”. Thus, according to the EPO, the reason why the present invention is unobvious over EP ‘024 in view of EP ‘588 is because EP ‘588 does not disclose zeolites of NaLSX type. See Decision, point 2.9.2, and page 11, second full paragraph.

As a matter of fact, Applicant respectfully submits that EP ‘588 teaches away from the present invention as EP ‘588 strongly criticizes the use of sodium zeolite X for carbon dioxide removal from gases under dynamic conditions, and teaches that CO<sub>2</sub> removal performances are higher when sodium is replaced by strontium. See page 2, lines 35-37.

In addition, EP ‘588 does not teach or suggest the importance of the limitation that “the content of residual inert binder in the adsorbent being less than or equal to 20% by weight”. In particular, EP ‘588 merely indicates that binder clays may be used in the amount of from 1% to 40%, without showing any superior effect when this amount is lower than 20%. Thus, EP ‘588 does not teach or suggest that the amount must be less than or equal to 20% by weight as required by the instant claims.

Specifically, the Decision indicates at point 2.9.2 that (1) EP ‘024 does not disclose a binder and does not disclose a degree of exchange with sodium of at least 98% for a zeolite of NaLSX type, and (2) EP ‘588 does not disclose the agglomeration of a zeolite of NaLSX type with a binder in an amount which is less than or equal to 20% by weight. Thus, the EPO held that a person skilled in the art would not have been motivated to agglomerate a zeolite of NaLSX type, which is exchanged with sodium to a degree of greater than or equal to 98%, with a binder in an amount which is less than or equal to 20% by weight. More is needed than the assertion that an NaLSX zeolite is better than an NaX zeolite in order to obtain the claimed invention, i.e. (1) sodium exchange to a degree of greater than or equal to 98%, and (2) agglomerating with a binder which is less than or equal to 20% by weight.

Thus, Applicant respectfully submits that the claimed invention is unobvious which is supported by the EPO as evidenced by the Decision.

Therefore, Applicants respectfully urge that the claims, as amended, are unobvious and the rejection under 35 U.S.C. 103(a) should be withdrawn.

*Should the Examiner disagree and not confer patentable weight to the Decision by the EPO, Applicant respectfully requests that the Examiner takes Official Notice stating that the U.S. Patent & Trademark Office (USPTO) does not recognize the EPO as a competent authority for determining what a cited document does or does not teach or suggest such that a decision by the EPO shall not be given consideration by the USPTO.*

### **Request for Interview**

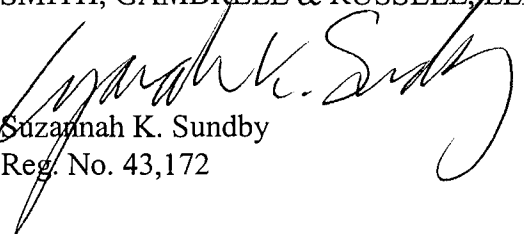
Applicants respectfully request either a telephonic or an in-person interview should there be any remaining issues.

### **CONCLUSION**

All of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Therefore, it is respectfully requested that the Examiner reconsider all presently outstanding rejections and that they be withdrawn. It is believed that a full and complete response has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

It is not believed that extensions of time are required, beyond those that may otherwise be provided for in accompanying documents. However, in the event that additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. 1.136(a), and any fees required therefor are hereby authorized to be charged to **Deposit Account No. 02-4300, Attorney Docket No. 033808.111.**

Respectfully submitted,  
SMITH, GAMBRELL & RUSSELL, LLP

  
Suzannah K. Sundby  
Reg. No. 43,172

Date: 17 June 2009

1130 Connecticut Ave., NW, #1130  
Washington, D.C. 20036  
Telephone: (202) 263-4332  
Facsimile: (202) 263-4352



EPO  
D-80298 Munich  
Tel. +49 89/2399-0  
Fax +49 89/2399-4465

European  
Patent Office  
Boards of Appeal

Pittis, Olivier  
L'Air Liquide, S.A.,  
Direction de la Propriété Intellectuelle,  
75 Quai d'Orsay  
75321 Paris Cedex 07  
FRANCE

Date 31.07.07
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Ref. OP574/OP/D1      OPPO 01	Application No. 99939170.9-2113/1062022
Applicant/Proprietor CECA S.A.	

**Case Number:**

<b>T 1362/04 - 3.3.06</b>
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Please find appended a copy of the decision dated  
04 July 2007.

[signature]

The Registrar    Gaby Rauh  
Tel.: 089/2399-3361

Annex(es):

**Recorded delivery letter**



**Case No.:** T 1362/04 - 3.3.06

**DECISION**  
**Of the Technical Board of Appeal 3.3.06**  
**Of 4 July 2007**

**Appellant:** L'AIR LIQUIDE, S.A. A DIRECTOIRE ET CONSEIL  
(Opponent) DE SURVEILLANCE POUR L'ETUDE ET  
L'EXPLOITATION DES PROCEDES GEORGES CLAUDE  
75 Quai d'Orsay  
F-75321 Paris Cedex 07 (FR)

**Agent:** Pittis, Olivier  
L'Air Liquide, S.A.  
Direction de la Propriété Intellectuelle,  
75 Quai d'Orsay  
F-75321 Paris Cedex 07 (FR)

**Appellee:** CECA S.A.  
(Proprietor of 4/8, Cours Michelet  
the patent) F-92800 Puteaux (Hauts de Seine) (FR)

**Agent:** Treuil, Claude  
ARKEMA FRANCE  
Département Propriété Industrielle  
4-8 cours Michelet  
La Défense 10  
F-92091 Paris La Défense (FR)

**Decision contested:** Decision of the Opposition Division of  
the European Patent Office, posted on  
12 November 2004, by which the  
opposition filed with regard to European  
Patent No. 1 062 022 was rejected in  
accordance with the provisions of  
Article 102(2) EPC.

**Composition of the Board:**

**Chairman:** P.-P. Bracke  
**Members:** G. Raths  
J. Van Moer

**Summary of the facts and pleadings**

I. European Patent Application No. 99 939170.9 gave rise to the granting of European Patent No. 1 062 022 on the basis of 9 claims. Claims 1 and 8 are set out as follows:

"1. Process for the decarbonation of a gas stream, preferably air, contaminated by CO<sub>2</sub>, characterized in that the gas stream to be purified is brought into contact, in an adsorption region, with at least one adsorbent essentially composed of a zeolite of NaLSX type with an Si/Al ratio of 1 to 1.15, exchanged with sodium to a degree equal to or greater than 98%, the degree of exchange being expressed as the ratio of the number of sodium ions to the number of aluminium atoms in the tetrahedral position, the remainder of the exchange capacity being occupied by potassium ions, which zeolite is agglomerated with a binder, the level of residual inert binder of the adsorbent being less than or equal to 20% by weight."

Claim 8 differs from Claim 1 in that the passage

"8. Process for the decarbonation of a gas stream, preferably air, contaminated by CO<sub>2</sub>, characterized in that the gas stream to be purified is brought into contact, in an adsorption region, with at least"

is replaced by the passage

"8. Process for the purification of air contaminated by CO<sub>2</sub> and H<sub>2</sub>O, characterized in that the gas stream to be purified is brought

into contact, in an adsorption region, with at least one drying agent, preferably based on alumina, and at least with".

The dependent Claims 2 to 7 and 9 respectively describe specific representations of the subject-matter defined in Claim 1 or Claim 8.

II. Opposition was filed against the abovementioned European Patent on the basis of Article 100(a) EPC on the grounds that its subject-matter was not novel within the meaning of Article 54(1)(2) EPC and did not involve an inventive step within the meaning of Article 56 EPC.

During the opposition proceedings, inter alia, the following documents were submitted:

- (1) EP-A-0 718 024;
- (2) Gas Separation by Adsorption Processes, Ralph T. Yang, Butterworths, 1987, pages 22 and 23;
- (3) US-A-3 356 450;
- (4) EP-A-0 294 588;
- (5) US-A-4 481 018;
- (6) US-A-2 882 244;
- (7) GB-A-1 580 928 and
- (8) US-A-3 078 639.

III. In its decision, the Opposition Division considered that the grounds for opposition put forward did not conflict with the maintenance of the patent in its form as granted.

IV. The Opponent (hereinafter the Appellant) filed an appeal against this decision.

- V. The arguments of the Appellant may be summarized as follows:

The subject-matter of Claim 1 is not novel in the light of the document (1), which specifies that the zeolite LSX used to adsorb the CO<sub>2</sub> in the process which is taught therein can have substantially all its cations exchanged by sodium cations (page 2, line 45, and page 3, line 24). Example 1 of the document (1) relates to a zeolite NaLSX, namely the sodium form of zeolite X, with an Si/Al ratio equal to 1.02.

According to Example 1 of the document (1), the adsorbent is used in the form of beds inserted into adsorption containers through which the gases to be purified move (page 4, lines 4 to 5), so that it is necessary for the adsorbent to be in the form of agglomerated particles (beads, extrudates or others) comprising the adsorbent zeolitic phase and an inert binder.

The document (1) thus discloses the two essential characteristics of the subject-matter of Claim 1, namely the degree of exchange with sodium of greater than or equal to 98% and the content of binder of less than 20%.

Starting from the document (1) as the closest state of the art, the technical problem to be solved consisted in improving the process of the document (1) in order to be able to more efficiently separate the CO<sub>2</sub> from a stream of air (see section 11).

A person skilled in the art was dissuaded from using LiRELSX and LiCaLSX catalysts mentioned in



the table of the document (1) because they were more expensive than those with sodium and because they were less efficient than those having the NaLSX form. There was therefore no surprising effect.

- VI. The Proprietor of the patent (the Appellee) refuted the arguments of the Appellant.
- VII. Oral proceedings took place on 4 July 2007 in the absence of the Appellant, of which the Board had been informed by the Appellant in its letter dated 3 May 2007.
- VIII. The Appellant requested, in writing, the annulment of the contested decision, the revocation of the patent and the reimbursement of the appeal fee.

The Appellee requests that the appeal be disallowed.

#### **Grounds for the decision**

##### **1. Novelty**

- 1.1 Any disclosure of the state of the art destroys the novelty of the claimed subject-matter when the latter derives directly and unequivocally from this disclosure, including the characteristics implicit to a person skilled in the art from what is expressly disclosed (T 511/92, point 2.2 of the grounds).
- 1.2 The process for the decarbonation of a gas stream according to Claim 1 of the contested patent comprises

- a) a zeolite of NaLSX type having an Si/Al ratio of 1 to 1.15, exchanged with sodium to a degree equal to or greater than 98%, and
- b) a binder, the level of residual inert binder of the adsorbent being less than or equal to 20% by weight.

- 1.3 According to the Appellant, the document (1) discloses a) the degree of exchange with sodium of greater than or equal to 98% and b) the binder.
- 1.4 It has not been disputed that the binder was not explicitly mentioned in the document (1). The Appellant has put forward that the beds inserted into adsorption containers according to the document (1) presuppose process conditions such that the adsorbent comprising the zeolite is in the form of agglomerated particles obtained with a binder.

In point of fact, the Board draws attention to the document (2), which discloses the manufacture of commercial zeolitic fragments or granules referred to as "pellets" (page 22, line 14 below): the crystals, after having been calcined, were agglomerated and put into the form of "pellets", with or without binder (page 23, lines 12 to 13).

The Board concludes that there are two manufacturing possibilities. If the document (1) does not disclose either of them, a person skilled in the art learns nothing therefrom. It follows that the disclosure of the binder does not derive directly and unequivocally from the document (1).

As regards the degree of exchange with sodium of greater than or equal to 98%, the Appellant has presented the following arguments:

The document (1) specifies that the LSX zeolite can have substantially all its cations exchanged by sodium cations (page 2, line 45, and page 3, line 24). Example 1 relates to an NaLSX zeolite with an Si/Al ratio of 1.02. The document (1) specifies that the zeolite is in its sodium form (page 4, lines 53 to 54).

The Appellant concludes therefrom that "substantially all its cations" means "all or virtually all", which would be equivalent to "100% or virtually 100%". In addition, "the zeolite in its sodium form" would mean "a zeolite having 100% of cations in the sodium form".

The Board does not accept the submission of the Appellant because the interpretation is speculative. The expression "substantially all" or "essentially all" does not comprise a precise quantitative value. As regards the expression "a zeolite in its sodium form", this expression does not comprise a quantitative value either. Consequently, the document (1) does not disclose a degree of exchange of greater than or equal to 98%.

The subject-matter of Claim 1 is novel and meets the conditions set out in Article 54(1) and (2) EPC.

## 2. *Inventive step*

- 2.1 The invention relates to the decarbonation of a gas stream by means of zeolitic adsorbents. It relates to the purification of gas streams contaminated by carbon dioxide, in particular to the purification of air before  $N_2/O_2$  separation stages (page 2, lines 5 to 6).

The process of the invention consists in bringing the said gas stream into contact with a zeolitic adsorbent of NaLSX type (page 3, lines 5 to 6).

The state of the art as described in the contested patent may be summarized as follows:

At temperatures in the vicinity of ambient temperature, the effectiveness of a conventional X zeolite, the Si/Al ratio of which is approximately 1.25, greatly decreases due to competition with nitrogen (page 2, lines 41 to 47).

The advantage of an X zeolite having an Si/Al ratio of less than 1.15, in comparison with a conventional X zeolite, lies in the fact that it is no longer necessary to reduce the temperature in the decarbonation stage by means of a cooling system. The increase in effectiveness of an NaLSX zeolite, the adsorption capacity of which increases with the degree of exchange with sodium, begins to reach a ceiling at degrees of exchange of the order of 90%. There is apparently no longer any advantage in pushing the exchange beyond 95% (page 2, lines 48 to 55).

- 2.2 According to the contested patent, the technical problem to be solved consists in improving the effectiveness for the decarbonation under low  $CO_2$

pressures, that is to say pressures of the order of 2 mbar (page 2, line 56, to page 3, line 1).

- 2.3 A decarbonation process is disclosed in the document (1) which was taken as starting point in evaluating the inventive step by the two parties, and the Board is won over to this reasoning.
- 2.4 The table according to the document (1) compares the performance of an NaX zeolite with an NaLSX, LiRELSX (RE representing a rare earth metal) and LiCaLSX zeolite. It turns out that, at a temperature of 35°C, the performance of LiCaLSX and LiRELSX prevails over that of NaLSX for CO<sub>2</sub> partial pressures varying between 2 and 100 mbar, whereas, at a pressure of 300 mbar, NaLSX prevails over the two abovementioned adsorbents. Comparative results are not available as regards the temperatures at 5°C and 50°C.
- 2.5 The Appellant has defined the problem underlying the contested patent in the light of the document (1) as an improvement in the process according to the document (1) in order to be able to more efficiently separate carbon dioxide gas from an air stream (letter dated 28 January 2005, page 7, B.3).
- 2.6 In the absence of an indication of the degree of exchange of sodium in the document (1), it is not possible to evaluate the increase in performance obtained by the claimed process in comparison with that promulgated in the document (1). That is why, in the light of the teaching of the document (1), the technical problem which the contested patent proposes to solve can only be that of making available another process for achieving

satisfactory decarbonation, which was not disputed by the Appellee during the oral proceedings.

- 2.7 According to Table 1 of the contested patent, the performances for CO<sub>2</sub> adsorption capacity at 25°C and at CO<sub>2</sub> partial pressures of 2 mbar, 5 mbar and 10 mbar obtained with granules of NaLSX zeolite agglomerated with 15% of binder and having a degree of exchange with sodium of 99.5% are superior to those obtained with a zeolite having a degree of exchange of 94.5% and 97.5%. For a degree of exchange of 97.5%, the growth in adsorption increase is 16.8%, 8.33% and 5.05%, in comparison with a zeolite having a degree of exchange with sodium of 94.5%, and, for a degree of exchange of 99.5%, the growth in increase is 28.8%, 12.9% and 7.7%, in comparison with a zeolite having a degree of exchange of 94.5%, for the three abovementioned partial pressures.
- 2.8 In the light of the examples of the contested patent, the Board is convinced that the problem as defined under point 2.6 is effectively solved by the claimed process, which consists in using an LSX zeolite having a degree of exchange with sodium of at least 98%, this degree of exchange being defined as the molar ratio of the sodium ions to the aluminium atoms in the tetrahedral position, the remainder being potassium, and the zeolite being agglomerated with a binder.
- 2.9 It remains to be decided whether the technical solution of this problem involves or does not involve an inventive step.
- 2.9.1 The Appellant argued that the binder and its concentration do not contribute in any way to the

solution of the technical problem for the following reasons:

The binder has only a negligible gas adsorption capacity (document (2), page 23, line 14). According to the documents (2), (3) and (4), it was known to use less than 20%, between 15 and 25%, as well as between 1 and 40%, respectively of binder. The document (4) disclosed the clay and the kaolin as binder which were also mentioned in the contested patent.

Furthermore, the sodium cation was not chosen from a large number of exchange cations since Example 1 of the document (1) relates to a zeolite of NaLSX type for which only a few cations, namely Li and Ca and generally rare earth metals, are mentioned. As the document (1) teaches that the zeolite must have substantially all its cations in the sodium form, a person skilled in the art would have tested the high values of exchange with sodium and would necessarily have arrived at the values of 100% or virtually 100%. Finally, there would have been no surprising effect as regards the CO<sub>2</sub> adsorption capacity.

#### 2.9.2 The Board does not accept these arguments.

The document (1) does not disclose a binder, neither explicitly nor implicitly, and does not disclose either a degree of exchange with sodium of at least 98% for a zeolite of NaLSX type (see point 1.4).

The document (2) does not teach the agglomeration of a zeolite of NaLSX type but of a zeolite of X type with a binder, and it discloses only two

options, the first consisting in agglomerating in the absence of a binder and the second in agglomerating with a binder up to a concentration of less than 20%. However, this document does not recommend any advantages which might be obtained by using a binder.

The Board concludes that the document (2) would not prompt a person skilled in the art to agglomerate the zeolite with a binder.

The document (3) does not disclose a zeolite of NaLSX type but only of X or A type. The documents (4) and (5) disclose zeolites of X type but do not disclose zeolites of NaLSX type.

The document (6) constitutes the basic patent for the synthesis of zeolites of X type. A person skilled in the art employing the minimum quality of silica source, so as to have an Si/Al atomic ratio in the vicinity of 1, would not, however, obtain a zeolite of LSX type but a mixture of X zeolite type and of a crystalline form of zeolite, as it happens zeolite A. This was not disputed by the Appellant.

Zeolites of LSX type can be synthesized according to the teaching of the document (7), the process of synthesis being different from that disclosed in the document (6) to which it was referred in the document (8) (see column 2, lines 17 to 19). The documents (6) and (8) relate to zeolites of X type.

The zeolites synthesized according to the document (7) generally comprise approximately 25% of potassium ions. Furthermore, it is necessary to



carry out several successive potassium-sodium exchanges in order to arrive at a degree of exchange with sodium above 90%. Consequently, the exchange of cations with sodium up to a degree above 98% was not obvious.

- 2.10 It follows that the subject-matter of Claim 1 involves an inventive step and consequently meets the conditions set out in Article 56 EPC.

As the subject-matter of independent Claim 8 also relates to a process comprising an adsorbent composed essentially of a zeolite of NaLSX type identical to that of Claim 1, the patentability of the subject-matter of this claim results from the patentability of Claim 1. It is the same for Claims 2 to 7, which are dependent on Claim 1, and for Claim 9, which is dependent on Claim 8.

3. The grounds put forward in support of the opposition consequently are not a bar to the maintenance of the patent as granted.
4. Reimbursement of the appeal fee.

According to Rule 67 EPC, the reimbursement of the appeal fee is ordered when an appeal is deemed to be allowable, if the reimbursement is equitable by reason of a substantial procedural violation.

As the appeal has not been deemed to be allowable, the Board does not have to give a ruling on the equity of the reimbursement.

**Order**

**On these grounds, the following ruling is given:**

The appeal is disallowed.

The request for reimbursement of the appeal fee is disallowed.

The Registrar:	[Stamp of the	The Chairman:
	Boards of Appeal of the	
[signature]	European Patent Office]	[signature]
G. Rauh		P.-P. Bracke